Remarks

Claims 1, 6-8, 10, 11 and 17 are pending. Claim 1 has been amended to incorporate the subject matter of claims 3, 5 and 9. Consequently, these claims (as well as claims 2 and 4) have been canceled as being redundant or inconsistent with the present claim coverage. Claim 17 has been amended as to dependency. No new matter has been added.

The Examiner mentions the priority requirements. Applicants note that the filing papers requested that the application be amended as required.

The Examiner rejects claims 1-11 and 17 under 35 U.S.C. 112(2) as being indefinite. The Examiner seems to be objecting to the phrase "comprising". While Applicants fail to understand how the conventional preamble could be indefinite, it has been replaced by consisting essentially of.

The Examiner rejects claims 1-11 and 17 under 35 U.S.C. 103 as being unpatentable over an abstract for DE 3,334,638 and published European patent application 586,911 ("EP '911"). The Examiner asserts that DE '638 teaches the use of compositions for improving soil quality by additions of water containing 60-80% nonionic polyacrylamide and 20-40% of an anionic sodium acrylate that has been crosslinked with MBA. The Examiner asserts that EP '911 teaches additions of water solutions to soil containing an anionic fertilizer and an anionic polymer, such as polyacrylamide. Applicants respectfully traverse this rejection.

The instant invention deals with an aqueous combined composition, which gives both fertilization and soil stabilization benefits. By virtue of the invention there is no need for separate addition points and it is possible to use dosing equipment currently in place for irrigation systems. (See page 3, first paragraph).

DE '638 deals with

- a solid compound and not with an aqueous composition,
- does not disclose a composition containing a fertilizer and a polymer,
- does not disclose a polymer that contains from 60 – 80 wt.% anionic polymer, but with a polymer containing 40 – 20 % of an anionic polymer.

The teachings of EP '911 do not address all of these deficiencies. Moreover, the reference teaches gels and not aqueous solutions. In view of the amendment to "consisting essentially of", the claims would exclude any component that would be contrary to the formation of an aqueous solution. The polymerization initiators for gelling the composition in EP '911 are clearly excluded. Therefore, even if DE '638 and EP '911 could be combined, the resulting combination does not disclose or suggest the claimed invention.

Applicants submit that the Examiner has failed to make a proper prima-facie showing of obviousness. Applicants request reconsideration and withdrawal of the obviousness rejection of the pending claims in view of DE '368 and EP '911.

Applicants also enclose a translation of a Japanese reference 51-124578, which was prepared for prosecution in a related application in Europe.

Respectfully submitted,

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Encl.: Translation of JP Sho 51-124578, October 30, 1976

Amended Claims with underlining and bracketing

1. (amended) An aqueous soil treatment composition ~~comprising~~ consisting essentially of water and, in solution,

(a) an ionic, water-soluble fertiliser in an amount of at least 10 wt.%, and

(b) a water-soluble anionic polymer which has intrinsic viscosity ~~at least 6 dl/g~~of from 9 to 12 dl/g and is formed from water-soluble ~~monomer or~~ monomer blend ~~of which at least 40 wt.% is anionic monomer~~comprising 60 to 80 wt.% anionic monomer and from 40 to 20 wt.% nonionic monomer, the composition having a viscosity of not more than 4,000 cps.

~~2. A composition according to claim 1 in which the polymer (b) has intrinsic viscosity from 8 to 18 dl/g.~~

~~3. (amended) A composition according to claim 1 in which the polymer (b) has intrinsic viscosity of from 9 to 12 dl/g.~~

~~4. (amended) A composition according to claim 1 in which the polymer (b) is formed from water-soluble monomer or monomer blend comprising at least 50 wt.% anionic monomer.~~

~~5. (amended) A composition according to claim 1 in which the polymer (b) is formed from water-soluble monomer blend comprising from 60 to 80 wt.% anionic monomer and from 40 to 20 wt.% non-ionic monomer.~~

6. (amended) A composition according to claim 1 in which the polymer (b) is a copolymer of acrylamide with an alkali metal salt of acrylic acid.

7. (amended) A composition according to claim 1 in which the polymer (b) is present in an amount of from 2 to 5 wt.%.

8. (amended) A composition according to claim 1 in which the fertiliser (a) is present in an amount of from 20 to 60 wt.%.

~~9. (amended) A composition according to claim 1 which has a viscosity of not more than 4,000 cps.~~

10. (amended) A composition according to claim 1 which has a viscosity of from 200 to 500 cps.

11. (amended) A composition according to claim 1 in which the polymer (b) has been added to the composition in the form of a powder.

17. (amended) A composition according to claim ~~9~~ 1 which has a viscosity of not more than 1,000 cps.

PATENT LAID-OPEN (A)

No. Sho 51-124578

October 30, 1976

Application No.:	Sho 50-48628
Filing Date:	April 23, 1975
Applicant:	Ryuichi Endo
Inventor:	Ryuichi Endo
Int. Cl²:	C 05 D 1/00
	A 01 N 7/02

SPECIFICATION

1. Title of the Invention

Aqueous solution-form soil conditioning fertilizer

2. Claim

An aqueous solution-form soil conditioning fertilizer comprising an acrylamide-potassium acrylate copolymer.

3. Detailed Description of the Invention

The present invention relates to an aqueous solution-form soil conditioning fertilizer which imparts to soil excellent water-resistant aggregation ability and water permeability as well as water retention property and, further which is useful mainly as a fertilizer having a delayed action with respect to nitrogen and potassium.

Conventionally, as a soil conditioning agent, synthetic polymers, such as polyvinyl alcohol, polysodium acrylate, polyacrylamide, and derivatives thereof, have been known. However, in many cases, these polymers have a problem in that the resultant water-resistant aggregates

cannot be stably maintained.

A task of the present invention is to solve the above-mentioned problem and to provide a soil conditioning fertilizer which is useful as a fertilizer having a delayed action.

The present inventor has made studies and, as a result, it has been found that the above task is achieved by an aqueous solution-form fertilizer comprised mainly of an acrylamide-potassium acrylate copolymer obtained by neutralizing a copolymer of acrylamide and acrylic acid by potassium hydroxide.

In the present invention, the acrylamide unit content of the acrylamide-acrylic acid copolymer can be appropriately changed if desired, but, from a practical point of view, it is preferred that the acrylamide unit content falls in the range of from 70 to 50 % by mole. The amount of potassium incorporated into the copolymer by the neutralization of the copolymer by potassium hydroxide can be appropriately changed, if desired, depending on the acrylic acid unit content of the copolymer.

In the present invention, it is preferred that the acrylamide-potassium acrylate copolymer is used in an amount of about 0.001 to 0.05 % by weight, based on the weight of soil, but, if desired, the copolymer may be used in a larger amount or in a smaller amount.

The concentration of the aqueous solution-form fertilizer of the present invention can be appropriately changed, but it is preferred that the fertilizer is diluted

to be in a low concentration before use and then used.

As a variation of the present invention, the aqueous solution of the copolymer can be used in the form of a complete fertilizer formed by adding a phosphorus fertilizer and a trace element fertilizer to the aqueous solution of the copolymer. The phosphorus fertilizer and the trace element fertilizer are those which are generally used and, especially preferably, those which can be dissolved or dispersed in the aqueous solution-form fertilizer of the present invention.

The aqueous solution-form soil conditioning fertilizer of the present invention is used in the same manner as in the use of a general water-soluble polymer for soil aggregation. Specifically, the fertilizer is diluted to be in a low concentration (e.g., 10 to 1 %), and the diluted fertilizer in an amount required for soil aggregation is uniformly applied to soil surface or incorporated into soil by an appropriate method, such as spraying or dusting, and, if desired, the soil may be intimately mixed with the fertilizer by turning the soil over.

Hereinbelow, the present invention will be described with reference to the following Examples, which should not be construed as limiting the scope of the present invention.

Examples

a) 23 g of KOH was added to a copolymer which was obtained by reacting 30 g of acrylamide with 30 g of acrylic acid in 300 g of water in the presence of potassium persulfate as an initiator, and a reaction was effected to obtain an aqueous solution of an acrylamide-potassium

acrylate copolymer. 30 g of $CaHPO_4$, 2 g of $FeBO_3$, and 2 g of $MgBO_3$ were added to the above-obtained aqueous solution and dispersed by stirring.

b) The resultant aqueous solution of an acrylamide-potassium acrylate copolymer was added to soil in an amount of 0.01 % by weight in terms of the solids content, based on the weight of the soil, and the aggregation effect was examined.

In the soil to which the acrylamide-potassium acrylate copolymer was added, aggregation was completed next day.

c) Using the above suspension in the present invention, a pot examination was conducted with respect to sand soil.

10 g of the suspension diluted to be in a concentration of 2 % was added to 1 kg of sand soil and, separately, 10 g of an aqueous solution of polyacrylamide having a concentration of 2 % was added to 1 kg of sand soil, and 2 seedings of China aster which had grown to be in a height of 4 cm were planted in each sand soil and cultivated while adding 50 cc of water to each sand soil every morning. After a lapse of one month, the average height of the plants in the soil containing the suspension in the present invention was 35 cm, whereas that of the plants in the soil containing the aqueous solution of acrylamide was 23 cm.

d) A small amount of water was added to clay soil and mixed with each other, and a small amount of the aqueous solution of the copolymer in the present invention was

added to the resultant clay soil to effect aggregation, and the resultant soil and the above clay soil containing no aqueous copolymer solution were placed on a filter paper and observed while comparing them. As a result, the soil containing no aqueous copolymer solution required a long time for dehydration and thus exhibited poor swab, whereas the soil containing the aqueous copolymer solution was easily dehydrated.

As is apparent from the above, the aqueous solution-form soil conditioning fertilizer of the present invention is advantageous not only in that it exhibits excellent aggregation effect and excellent water retention property as well as excellent water permeability, but also in that it has a property such that potassium contained in the copolymer and nitrogen (N) in the amide group gradually act as a fertilizer moiety.

Amendment

January 27, 1977

Ishiro Katayama, Commissioner, Patent Office, Esq.

1. Indication of the Case
Japanese Patent Publication No. Sho 50-48628

2. Title of the Invention
Aqueous solution-form soil conditioning fertilizer

3. Person amending
Name: Ryuichi Endo

4. Subject to be amended
Column of Detailed Description of the Invention in the specification

5. Content of Amendment
Add the following amendment to the specification.
1) Insert the following after the last line of page 5 of the publication.
"Germination examination
1. Purpose of examination
The effect of the acrylamide-potassium acrylate copolymer on the germination of pakchoi is examined.

2. Examination method
a) A test liquid composite fertilizer and a control liquid composite fertilizer are as follows.

The control liquid composite fertilizer comprises 30 parts by weight of $(NH_2)_2CO$, 15 parts by weight of K_2HPO_4,

0.01 part by weight of $K_2B_2O_3$, and 54 parts by weight of water. 1 Part by weight of an acrylamide-potassium acrylate copolymer was added to the control liquid composite fertilizer, and the resultant mixture was examined as a test liquid composite fertilizer. Analysis results with respect to N, P_2O_5, and K_2O contained in each fertilizer are as follows.

	N	P_2O_5	K_2O
Test liquid composite fertilizer	13.30	7.44	6.80
Control liquid composite fertilizer	13.3	7.4	6.8

b) Test soil and plant

Humus volcanic ash soil (Suginami, Tokyo)

Pakchoi: 25 seeds/pot

400 g of the test soil was placed in a Neubauer pot, and the test fertilizer and the control fertilizer were individually mixed well with the entire soil, and then the soil moisture content of each soil was adjusted so that it became about 70 % of the maximum moisture capacity of each soil. The seeds were sowed in each soil and the germination and the growing state after germination were inspected.

3) Section for test and amount of fertilizer applied

Section	N mg				
Test liquid composite fertilizer	200	300	400	500	
Control liquid composite fertilizer	200	300	400	500	
No fertilizer					0

4) Summary of cultivation

Soil placing	October 31
Fertilizer application and moisture adjustment	October 31
Sowing	October 31
Inspection of grown plants	November 30

4. Results of examination

Germination was observed after 2 days from sowing, and no difference was found in the germination starting date between the test fertilizer section and the control fertilizer section or between the various amounts of the fertilizers applied.

There was almost no difference in the growing state after germination at the initial stage, but, in accordance with the progress of the growth, it was observed in the soil containing a fertilizer in a larger amount that an excess of the fertilizer applied caused some delay in growth.

It is noted that this tendency was observed in both the test fertilizer section and the control fertilizer section, and thus there was particularly no difference in the growing state between the test fertilizer and the control fertilizer.

During the examination duration of one month, no symptom of disease was shown in any plants.

Results of inspection of germination and growing state

Section	N (mg)	Germination rate (%)			Number of seed leaves developed (piece)		
		Nov. 2	Nov. 3	Nov. 5	Nov. 5	Nov. 7	Nov. 10
Test liquid composite fertilizer	200	40.0	98.0	100.0	3.5	24.0	24.5
	300	34.0	96.0	98.0	4.0	24.0	24.0
	400	36.0	100.0		5.0	23.0	25.0
	500	38.0	98.0	100.0	6.5	20.0	24.5
Control liquid composite fertilizer	200	32.0	98.0	100.0	4.0	24.5	25.0
	300	34.0	96.0	98.0	5.0	22.0	24.0
	400	28.0	96.0	96.0	5.0	23.5	24.0
	500	36.0	98.0	100.0	5.5	22.0	24.5
No fertilizer	0	32.0	98.0	100.0	7.0	24.5	24.5

Results of inspection of grown plants

Section	N (mg)	Leaf length (cm)	Leaf width (cm)	Green leaf weight (g)
Test liquid composite fertilizer	200	13.5	2.8	24.2
	300	14.0	2.7	23.4
	400	12.0	2.5	22.1
	500	11.0	2.0	20.6
Control liquid composite fertilizer	200	14.0	2.9	23.8
	300	13.5	2.6	23.8
	400	12.5	2.6	22.9
	500	11.0	1.9	20.0
No fertilizer	0	7.5	1.5	10.5

Observations

The test fertilizer did not particularly adversely affect the germination or the growing state after germination of pakchoi (crucifer), as compared with the control liquid composite fertilizer.

(Examined in Japan Fertilizer Approval Association)